The term "deposit", as used herein, refers to both mines and prospects; in general, each contains or has contained indications of ore minerals in sufficient quantity to encourage exploration. Claims may or may not be active. A mine has recorded production, although in some cases ore may not have been shipped. A prospect has had some exploration, but lacks evidence of production. Probably many of the placer gold deposits that are listed as prospects have had at least meager unrecorded production. An occurrence, on the other hand, is an unexplored site that apparently contains only minor amounts of ore minerals. We did not visit some of the occurrences shown on the U.S. Bureau of Mines (1980) map of claims; without further information, these occurrences should be regarded as minor. Undoubtedly some occurrences that we show are more significant than was apparent from our brief reconnaissance and they may merit more detailed examination. Numerous, apparently insignificant, minor occurrences are not included in the table and map, nor are unevaluated occurrences of apparently anomalous concentrations of metals in rock geochemical samples (Miller, 1981). Deposits of non-metallic or energy commodities generally are not shown in the table and map, either because they have little potential or because they are integral constituents of extensive rock units which cannot be represented as a point source. METAL COMMODITIES

Thin layers, lenses, and disseminations of chromite are present in many places in the quadrangle in layered ultramafic and mafic plutons. Prospects in partly serpentinized dunite and peridotite at Bernard and Dust Mountains (42, 43) in the Tonsina ultramafic body have been reevaluated recently, but, despite proximity to transportation (the Richardson Highway), sufficient quantities of ore-grade chromite have not been proven. Pyroxenite is a minor constituent of the Tonsina body; generally the pyroxenite contains anomalous amounts of nickel and copper; chalcopyrite flecks are present in a few samples. Traces of cobalt and platinum-group elements also occur in the Tonsina body, but concentrations have not been found. Layered ultramafic bodies, which now are strongly deformed and serpentinized, are present in many places along or near the Border Ranges, Second Lake, and Spirit Mountain faults. Generally the bodies are small and thoroughly serpentinized; their potential for chromite is unevaluated but probably is low. In the northwestern part of the quadrangle near the headwaters of Barnette Creek (83) and along Klanelneechena Creek, extensive strongly-deformed ultramafic rocks are present; they are virtually unexplored.

The numerous copper deposits in the quadrangle are categorized into the following types: (1) veins and associated deposits (a few of which may be "Kennecott type"); (2) submarine volcanogenic deposita ("Prince William Sound type"); and (3) copper-molybdenum porphyry deposits. Many of the deposits were located and explored briefly during the first quarter of this century; only a few have been explored extensively; and only the Midas Mine (32) has had any significant

## Veins and associated deposits

Copper-bearing veins and associated small pods, disseminations, and surface coatings are localized in rocks that range from late Paleozoic (Skolai Group) to late Mesozoic (Valdez Group). In most places, the deposits are in or near fractures or faults; many of them exhibit hydrothermally altered wallrock, but a few show little or no wallrock alteration. The copper-bearing veins range from discrete solitary veins to multiple networks. They generally are a few millimeters to a few centimeters thick and rarely can be traced for more than a few tens of meters along strike. A few veins or pods are rich, but most contain only sparse or irregularly-distributed concentrations of ore minerals. Typical veins or pods contain chalcopyrite, bornite, and pyrite in a quartz and(or) calcite gangue; a few contain covellite or chalcocite and traces of sphalerite or galena. The veins and associated deposits probably have been generated in

more than one way. Thus, although deposits in the Skolai Group may have originated through submarine volcanism (48-51, 108), and other deposits in the Nikolai Greenstone and basal Chitistone Limestone may have originated through subaerial volcanism (53-56) or sabkha remobilization ("Kennecott type": 57-58); most deposits have been concentrated in fractures, faults, or hydrothermally altered zones. Similar field relations in the McCarthy quadrangle led MacKevett (1976) to infer that vein and associated deposits there mainly were produced by hydrothermal processes related to Late Jurassic or Tertiary plutonism, an inference that seems equally warranted for deposits in the Valdez quadrangle also. A few copper-bearing veins and disseminations occur in polyphase metamorphic rocks of the Haley Creek and Fox Creek terranes (81, 103-105); their origins are entirely conjectural. Submarine volcanogenic deposits

Tholeitic metabasalt and diabase, mafic metatuff, and associated nonvolcanogenic metasedimentary rocks of the Valdez Group host massive, vein, and disseminated copper-zinc (-lead-silver) deposits (29-30, 32-33, 78-79) that are similar in setting and mineralogy to numerous deposits in Prince William Sound. The deposits in the Valdez quadrangl are crudely stratiform, although they have been remobilized and enriched along fractures and faults and also form cross-cutting polymetallic sulfide-bearing quartz and calcite veins. Richest ore tends to be localized in sedimentary rocks that are proximal to volcanic rocks; that is one manifestation of the tendency for the sulfide minerals pyrite and pyrrhotite to predominate in the volcanic rocks, and for

chalcopyrite, sphalerite, and galena to increase in proportion in the

The Midas Mine in Solomon Gulch (32), the outstanding example of this type of deposit in the quadrangle, produced more than 500 tons of copper during its approximately eight years of production (1911-1919); its ore is not depleted. Prospects several kilometers to the east near Sulphide Gulch (33A, B) probably have greater tonnage but are significantly lower grade. Additional occurrences at Wortmanns and Tsina Glaciers (78, 79) that we examined during our field work appear also to be large, but low-grade deposits. Proximity to the Richardson Highway may enhance the potential of some or all of these deposits. Copper-molybdenum porphyry

Two sulfide-bearing quartz vein systems that are associated with plutons have been located in the Valdez quadrangle. The larger of these systems (61), which is exposed along the bluffs of the Chitina River near its mouth, has been explored cursorily and consists of disseminations and small concentrations of chalcopyrite and molybdenite in an Upper Jurassic biotite granodiorite pluton near its contact with greenstone of the Skolai Group. The smaller of these systems (84), which is exposed in the canyon at the west end of Heavenly Ridge apparently is unexplored. It may not be a true porphyry, inasmuch as it consists largely of sulfide-impregnated quartz veins in conspicuously iron-stained volcanic breccia of the Talkeetna Formation near its contact with a small Tertiary(?) dacite plug. Iron-staining is widespread in the Talkeetna Formation in the adjacent area, and may indicate the presence of other undiscovered occurrences. Analyses of stream-sediment samples from drainages in the area show the presence of some anomalous concentrations of molybdenum, copper, and zinc.

Lode and placer gold deposits are widespread in the Valdez quadrangle, especially in rocks of the Valdez Group or placers derived therefrom. Lode deposits produced most of the 137,600 Troy ounces of gold from the districts of Prince William Sound, part of it as a byproduct in the mining of copper; total production from the Valdez quadrangle alone is unknown. Placer gold deposits are small and have had only minor production (Koschmann and Bergendahl, 1968, p. 32). Trace amounts of placer gold probably are present in most streams in the quadrangle. Lode deposits

The gold lodes of the Cliff mine (15) on the north shore of Port

Valdez were the chief source of production in the quadrangle and are similar to most other lode deposits within rocks of the Valdez Group. The deposits mainly consist of diversely oriented quartz or quartzcalcite veins and adjacent altered zones. The gold-bearing veins generally are thinner than a few tens of centimeters, although they may be as thick as 2 m, and they cannot be traced laterally more than a few hundred meters. Many veins pinch and swell markedly over short distances. The gold is free and is visible in some veins; most veins also contain pyrite, arsenopyrite, chalcopyrite, sphalerite, and galena; a few veins in the Columbia and Shoup Glacier areas also contain stibuite. The veins are genetically related to the waning stage of greenschist facies metamorphism of the Valdez Group; many veins are accompanied by felsic to intermediate dikes which also are mineralized. Altered granite at the Gold King mine (2) has been dated by K-Ar as 51.6 + 1.5 m.y. and metatuff in the Valdez Group has been dated as 53.5 + 1.6 m.y. (Winkler, Silberman, and others, 1981). These ages are similar to ages of goldbearing rocks in the Valdez Group from the Hope district of the Kenai Peninsula to the west (52.7, 53.2 + 1.6 m.y., Silberman and others, 1981), and presumably indicate an Eocene age of regional lode gold mineralization.

Gold lodes at the Opal mine west of Chitina (45) also consist of polymetallic sulfide-bearing quartz veins that cut, and probably are cogenetic with, a small dated Eocene pluton (52.4 + 2.6 m.y., Winkler, Silberman, and others, 1981). Gold-bearing quartz veins in the Wrangell Mountains (59, 109, 110, 112) occur in low-grade metamorphic rocks of the Skolai Group. These deposits are poorly studied, but they are related spatially, and probably temporally, to Upper Jurassic plutons.

## Placer deposits

Placer deposits are known to be present in nearly all the streams that drain areas of lode gold mineralization in the Valdez Group. In addition, placer gold was produced from the Little Bremner River (71) early this century. Although no lode gold occurrences are known to be present in the drainage, the country rock is the Valdez Group with felsic dikes - that is, rocks that are very similar to those that host lode deposits elsewhere in the quadrangle. Generally the placers contain only very fine gold and are lean. Many of the larger drainages that flow northward from the Chugach Mountains have been diluted additionally by glacial deposits derived from the north (Williams and Johnson, 1981).

Peridotite and pyroxenite sills that intrude amphibolite-facies and retrograded greenschist-facies metamorphic rocks of the Haley Creek terrane near Spirit Mountain (52, 106) contain massive and disseminated nickel and copper sulfide minerals, as well as pyrite and pyrrhotite. Arsenic, cobalt, silver, and platinum-group elements (chiefly palladium) are present in some samples from the Spirit Mountain prospect (52), which is the only deposit that has been explored well. Anomalous concentrations of nickel, as well as spot occurrences of high copper, chromium, and cobalt values characterize both the layered ultramafic bodies such as Bernard and Dust Mountains (42, 43) and the serpentinized ultramafic bodies emplaced near or along the Border Ranges (83), Second Lake, and unnamed fault zones along the north flank of the Chugach Mountains. The sheared masses of ultramafic rock are essentially unexplored.

Silver occurs as a byproduct metal in many sulfide deposits in the Valdez quadrangle. Host rocks for silver-bearing veins range from the late Paleozoic Skolai Group (59) to an Eocene tonalite pluton (45). Up to 150 parts per million (ppm) of silver occurs in polymetallic lodes that are notable principally for gold (e.g., deposits near Columbia, Shoup, and Valdez Glaciers, and near the Tiekel River); silver also is potentially a significant byproduct metal at most of the lode copper deposits, such as the Midas mine (32), which generally contain between 10 and 150 ppm. Up to 20 ppm silver also are present in samples

Zinc is an important potential byproduct of many copper and gold deposits in the quadrangle. In the copper deposits, sphalerite is a common constituent of the sulfide minerals in the Midas mine (32), at prospects near Jack Bay (29, 30) and Sulphide Gulch (33), and at occurrences near Wortmanns and Tsina Glaciers (78, 79). Sphalerite also is present in most of the gold-bearing veins, especially near Columbia (2-4) and Shoup (8, 10-14, 16) Glaciers, at the Cliff mine (15), along Mineral Creek (19-23), near Valdez Glacier (26, 28, 88), near Hurtle Creek (40), and the Tiekel River (60, 94), and the Opal mine (45) west of Chitina. The sphalerite typically is associated with lesser amounts of galena, although galena occurs in some veins from which sphalerite has not been reported (e.g., 36). Minor amounts of silver and cadmium also generally are associated with the sphalerite and galena in the gold-bearing veins.

At Willow Mountain (44), zinc and copper minerals are disseminated through large volumes of iron-stained mafic tuff and breccia of the Talkeetna Formation; exposures at pipeline cuts along the Richardson Highway and at the summit of the mountain near the microwave towers are stained over wide areas. Sphalerite is disseminated in iron-stained calcareous rocks of the Haley Creek terrane, most notably at occurrences along the ridge north of the Uranatina River (80) and at the headwaters of Canyon Creek (81); no concentrations of sphalerite are known. Although the host rocks are strongly cataclasticd, the cataclastic foliation parallels lithologic contacts in the rocks; thus, the mineralization, which extends for hundreds of meters parallel to the foliation, is crudely stratiform. These stained zones occur at several horizons and are virtually unexplored.

The quadrangle contains large resources of limestone, and of sand, gravel, and rock suitable for industrial and construction purposes (see Williams and Johnson, 1980). Known resources of other nonmetallic commodities are negligible. Large-scale utilization of nonmetallic commodities is largely dependent upon proximity to urban or industrial centers, upon high-volume production, and upon low transportation costs. Unless the Copper River Basin or Valdez areas undergo expansion not presently anticipated, nonmetallic commodities probably will be exploited only locally in small quantities.

Carbonate rocks are widespread in the quadrangle, especially the northeastern part. Their distribution is depicted in a companion geologic map (Winkler, Silberman, and others, 1981). Limestones within the Skolai Group and the Chitistone Limestone in the Wrangell Mountains, the Chitina River valley, and the northernmost Chugach Mountains generally are rather pure calcium carbonate and thus are well suited to industrial uses. Marbles within the Haley Creek terrane are widespread, but they have more variable compositions: although nearly pure calcium carbonate is present locally, most marbles have sufficient siliceous impurities to impare their value. Elsewhere in the quadrangle, small marbls bodies are widely scattered through outcrops of the McHugh Complex along the northern flank of the Chugach Mountains. They vary in purity, however, and are of such limited distribution and size that they do not merit economic consideration.

### Sand, gravel, and rock

Sand, gravel, and rock occur widely in the quadrangle, and have had limited local use in construction of roads and similar projects. Sand and gravel are present in large volume in many places in the Copper River Basin and in braided floodplains or glacial moraines within the mountains. Various bedrock formations could provide rock for a variety of industrial uses. These commodities are in ample supply for local demand. It is not likely that they merit exportation, for they are available locally in nearby regions.

### ENERGY RESOURCES

# Geothermal Resources

Heat flux at the summit crater of Mt. Wrangell has been increasing consistently for the past decade (Benson and Motyka, 1979), causing melting of the summit ice cap, seasonal exposure of bare ground on the north slope of the crater, and intermittent ash falls that darken the summit area. Although the volume of the magma chamber under Mt. Wrangell is estimated to be approximately 50 cubic kilometers (Smith and Shaw, 1975), its potential use as a large-scale source of geothermal power is constrained by its lofty elevation and its remoteness from potential power demand. Areas of abnormally high heat flux are not known at lower elevations on the west flank of the volcano, where development costs would be less prohibitive.

## Nuclear Fuels

Weakly anomalous radioactivity was detected in several areas of lometer surveys of sections in the lower part of the Wrangell Lava

MAP AND SUMMARY TABLE DESCRIBING MINERAL DEPOSITS IN THE VALDEZ QUADRANGLE, SOUTHERN ALASKA

Ву

near Barnette Creek (83). Host rocks in these two locations are mafic and ultramafic plutonic rocks.

### NONMETALLIC COMMODITIES

the quadrangle during an airborne radiometric survey (LKB Resources, 1978). Reconnaissance surveys on the ground with a hand-held scintillometer verified that the sources of radioactivity were Upper Jurassic and Tertiary plutons. Apparently potassium decay is responsible for the radioactivity; no uranium or thorium minerals were found in the plutons nor in any other rocks in the quadrangle. Detailed scintilfailed to reveal any sources of radioactivity. Hence the potential for uranium or thorium in the quadrangle is poor.

No petroleum resources are known in the Valdez quadrangle, and the potential for them is poor. Possible source rocks are limited to the Chitistone Limestone, which in places is fetid when freshly broken. Possible reservoir rocks are extremely rare and are limited to sandstone in Jurassic and Cretaceous sedimentary rocks in the Wrangell and northernmost Chugach Mountains, which constitute part of the Matanuska-Wrangell terrane. Generally these sandstones are well indurated with low porosities and permeabilities. Framework grains mostly are volcanogenic, and interstices between grains are plugged with the diagenetic products of their alteration. These sedimentary rocks show no evidence of having generated or harbored petroleum.

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LOCATION--Location refers to the standard township and range land designations referenced to the Copper River Meridian. Some deposits extend into more than one township or range.

Explanation of Table Headings

MAP NO. AND NAME(S) (if known) -- Map no. refers to a specific deposit or

CATEGORY--Mineral deposits and occurrences in the Valdez quadrangle are subdivided into five categories that are indicated by the following abbreviations: M = mine with no known post-1950 activity; M = mine with known or probable post-1950 activity; P = prospect with no apparent post-1950 activity; P = prospect with apparent post-1950 activity; 0 = occurrence.

RESOURCES--Indicates by standard chemical symbols the main mineral commodity or commodities that have been produced or are noteworthy at the deposit or occurrence (subordinate commodities or potential by-products are shown in parentheses).

FORM--Denotes the physical aspect of a deposit: whether it is disseminated or massive, occurs in veins or as replacements, is a lode or a placer.

TYPE--The deposits are classified according to general deposit types, most of which have genetic connotations. In a broad sense, most metal-bearing deposits are hydrothermal; in the cases where deposits do not conform to other types, they are listed as hydrothermal. Due to lack of information, classification for some deposits is arbitrary; it is queried.

BRIEF DESCRIPTION--Briefly summarizes the geology and mineralogy of the deposits and, in a few cases, includes production and historical data.

PRINCIPAL REFERENCES--Cites sources for information used in the table and map, which are included in the list of references cited.

### Abbreviations Used Locations: T = township; R = range; S = south; W = west; N = north;

Resources: Standard chemical symbols -- for example, Au = gold; Pt =

Dimensions: km = kilometer; m = meter gn = galena Minerals: aspy = arsenopyrite ba - barite lim - limonite ml = malachite bn = bornite

calc = calcite mo = molybdenite cc = chalococite po = pyrrhotite py = pyrite chl = chlorite chrys = chrysocolla qz = quartz cl = chalcanthite sb = stibnite cp = chalcopyrite sl = sphalerite cv = covellite

MINES, PROSPECTS, AND MINERAL OCCURRENCES IN THE VALDEZ QUADRANG

MAP NO. AND NAME(S)

(if known) LOCATION CATEGORY OPERATION FOR TYPE BRIEF DESCRIPTION REFERENCES

NAME (S) PRINCIPAL FOR TYPE BRIEF DESCRIPTION REFERENCES

			byproducts in parentneses	· Oic.			ALI BREWES
Rough and Tough (Reeve and Thompson, Ruff and Tuff)	T.85,R.9W	м	Au (Ag)	Vein	Hydro- tnermal	Thin py-pearing gz veins in Valdez Group slate and graywacke and Tertiary diorite; minor production	Smitn, 1939, p. 27
Gold King	T.85,R.8W	М	Au (Sb, Zn, Cu, Pb)	Vein	Hydro- thermal	Oz veins and stringers in Valdez Group graywacke and argillite near granite; the veins contain about 3 percent sulfides including py, gn, sl, cp, and so	183-185
Cameron-Johnson (Valdez Gold), Minnie, Olson, (Bald Mountain) Rambler	T.85,R.8W	м	Au (Pb, Zn)	Vein	Hydro- thermal	Several claims on numerous	1915, p. 172-174, 179-180; Johnson,
National, Mayfield	T.85,R.9W	M	Au (Cu, Pb, Zn)	Vein	Hydro- thermal	Qz veins, lenses, and	Jonnson, 1916, p. 143, 145; Jonnson, 1915, p. 185-186
Bessie Williams	T.85,R.9W	P	Au	Vein	Hydro- thermal	Oz veins in Valdez Group metasedimentary rocks	Jonnson, 1915, p.
Big Four, Hecla	T.85,R.8W	P	Au (Ag, Pb)	Vein	Hydro- thermal	Oz and gz-calc veins as much as 1 m thick in Val- dez Group, mainly slate; the veins contain py, aspy gn, and a little Au	Brooks, 1912, p. 124
Palmer	T.85, R.8W	P	Au	Vein	Hydro- thermal	Brecciated qz vein and qz	Brooks, 1912, p. 124
I.X.L., Shoup Bay Mining Co., Silver Gem, Spanish	T.85,R.8W	М	Au (Ag, Pb, Zn, Sb)	Vein and dissem- insted	Hydro- thermal	Oz stringers and thin crushed qz-calc veins that contain fragments of Valde Group country rocks; local py impregnations; deposits contain py, aspy, gn, si, sb, and Au	z 123-124 Johnson
Bluebird, Whistler	T.8S,R.8W	P	Au (Cu, Pb)	Vein and dissem- inated	Hydro- thermal	The Bluebird is on a min- alized shear zone as much as 3 m wide that cuts the Valdez Group and contains fragments of a mafic dike cemented by qz and calc that carry py, po, cp, and qn; the Whistler is on a qz vein that contains frag ments of mineralized Valde Group slate, py, and a little Au	
Alice	T.8S,R.8W	М	Au (Ag, Cu, Pb, Zn)	Vein	Hydro- thermal	Thin gz weins and veinlets in brecciated shear zone that cuts schistose Valdez Group rocks; the deposit contains Au, py, cp, aspy, sl, and gn	Jonnson, 1915, p. 175-176
Bunker Hill, Seacoast Mining Co.	T.8S,R.8W	м	Au (Cu, Pb, Zn)	Vein and lens	Hydro- thermal	Thin gz-calc veins and lenses in schistose gray- wacke and argillite of Valdez Group; contains Au, py, gn, po, cp, and sl	Johnson, 1915, p. 178-179, 181
Gold Bluff, Sealey-Davis	T.85,R.8W	М	Au (Cu, Pb, Zn)	Vein and lens	Hydro- thermal	Thin qz veins, veinlets, and lenses in shear zones; mainly in schistose gray- wacke of Valdez Group; contains Au, py, aspy, cp, sl, gn, and po	Jonnson, 1915, p. 174-175, 182
Guthrie and Belloli	T.85,R.7W	P	Au (Cu, Pb, Zn)	Vein	Hydro- thermal	Oz vein about 1 m thick that cuts Valdez Group graywacke and argillite; contains calc, chl, py, cp, aspy, sl, gn, and lim	Jonnson, 1915, p. 181
Cube (Three in One)	T.8S,R.7W	м	Au (Cu, Pb, 2n)	Vein	Hydro- thermal	Oz vein that averages ca. 0.5 m thick and cuts Val- dez Group schistose gray- wacke and argillite: the vein contains Au, cp, sl, gn, and aspy	Johnson, 1915, p. 176-177; 1919a, p. 150- 151
Cliff	T.95,R.8W	м	Au (Pb, Zn,	Vein and impreo- nation	Hydro- thermal	Diversely oriented, inter- lacing qz veins less than 1 m thick that cut schis- tose graywacke of Valdez Group; the veins contain Au, aspy, py, si, and gn; largest producer of Au in Valdez district	Jonnson, 1915, p. 152-153, 154, 170-172; Moffit, 1954, p. 304-306
Owl, Thompson- Ford	T.8S,R.7W	M	Au (Cu, Pb, Zn)	Vein and lens	Hydro- thermal	Thin gz veins and lenses in Valdez Group; the veins contain minor amounts of Au, calc, cp, py, si, gn, and lim; minor production from Thompson-Ford	Jonnson, 1915, p. 177, 180-181
Alaska Gold Hill (Bleck Diamond)	T.8S,R.7W	P	Au	Vein	Hydro- thermal	Probably Au-bearing qz veins in Valdez Group	Jonnson, 1919a, p. 151
Quitsch	T.75,R.6W	P	Au (Pb)	Vein	Hydro- thermal	Thin gz vein in Valdez Group graywacke; the vein contains minor Au, gn, and py	Jonnson, 1915, p. 16-
Big Four	T.75,R.7W	М	Au (Pb, Zn)	Vein	Hydro- thermal	Oz veins as much as 1 m thick in Valdez Group slate; veins contain Au, py, gn, and si	Johnson, 1915, p. 164-165; Smith, 1937, p. 23-24
Hercules, Chesna, Monte Carlo, Sunshine, Slide, Millionaire	T.7S,R.6W	М	Au, Cu (Pb, 2n)	Vein	Hydro- thermal	Thin gz veins in Valdez Group slate and graywacke; veins contain calc, py, gn, chl, sl, and po	Jonnson, 1915, p. 165-166, 168; Jonnson, 1919a, p. 151; Brooks, 1912, p. 125-126
Forty Five, High Grade	T.85,R.6W	P	Au (Cu, Pb, Zn)	Vein	Hydro- thermal	Narrow qz veins in sheared Valdez Group graywacke; veins contain py, gn, sl, cp, and Au	Jonnson, 1915, p. 166-167
Alaskan	T.85,R.6W	P	Au (Cu, Pb, 2n)	Vein	Hydro- thermal	Oz vein in sneared gray- wacke of Valdez Group; contains some py, gn, cp, sl, and Au	Jonnson, 1915, p. 169
Mountain View (Hickey), July, Little Giant, Mountain King, Rose (Rose Quartz), Star	T.75,R.6W	н	Au (Cu, Pb, Zn)	Vein	Hydro- thermal	Thin gz veins in Valdez Group schistose graywacke; the veins contain py, gn, sl, snd locally cp and Au; minor production from Little Giant, Rose, Star, and Mountain King	Johnson, 1915, p. 163-164, 167-169; Smath, 1937, p. 22, 24
Ethel (Williams- Gentzler), Blue Ribbon	Tps.7,8S, R.6W	м	Au (Pb)	Vein	Hydro- thermal	Oz veins in Valdez Group that contain Au, po, py, snd gn; minor production from Ethel	Johnson, 1915, p. 164; Smith, 1930, p. 16;
Valdez Bonanza,	T.8S,Rs.5,6W	м	Au	Vein	Hydro-	Qz veins as much as 2 m	Brooks, 1912, p. 127 Brooks,
Ibex, Valdez					thermal	thick in Valdez Group; minor production from Valdez	1912, p. 127; Brooks, 1922, p. 40; Johnson, 1915, p. 162
Rose Johnson	T.8S,R.5W .	н	Au (Cu, Pb, Zn?)	Vein	Hydro- thermal	Thin gz veins that cut black slate and green- stone of Valdez Group; the veins contain Au, Cp, py, gn, and sl?	Johnson, 1915, p. 162-163
Pinochle	T.8S,R.5W	P	Au	Vein and lens	Hydro- thermal	Small qz veins and lenses in Valdez Group graywacke and argillite; minor py and Au associated with the qz	Johnson, 1915, p. 161-162
Ramsay-Rutherford	T.85, R.5W	м	Au (Ag, Cu, Pb, Zn)	Vein	Hydro- thermal	Oz veins, typically less than 1 m thick, that are brecciated locally and cut Valdez Group rocks, chiefly graywacke; the veins contain Au, calc,	Johnson, 1915, p. 159-161; MoEfit, 1954, p. 306
						po, py, cp, sl, and gn	

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29 30 31 32 33 A, B	Jack Bay (1)	LOCATION T.95,R.8W	CATEGORY	RESOURCES Minor constituents or potential byproducts in parentheses	FORM	TYPE	BRIEF DESCRIPTION	PRINCIPAL REFERENCES	MAP NO. AND NAME(S) (if known)	LOCATION	CATEGORY	RESOURCES Minor constituen or potential byproducts in	FORM	TYPE	SRIEF DESCRIPTION	RE
31 32 33 A, B 34 35 36		T.95,R.8W	P									perentheses				
31 32 33 A, B 34 35	Jack Bay (2)			Cu (Zn, Pb)	Dissem- inated		Mineralized snear zone about 1 m wide in Valdez Group graywacke; contains aspy, cp, po, sl, and gn; several other copper occur	Moffit & Fellows, 1950, p. 53; Jonnson,	70 Tiekel River 71 Little Bremner	T.75,R.3E	P	Au	Dissem- inated		Small placer Au deposits Shallow placer deposits in	Br 19 p.
31 32 33 A, B 34 35	Jack Bay (2)					thermal	? rences in vicinity	19195, p. 171- 171	River		n		inated		Valdez Group terrane that contains some porpnyry dikes	Mo 19 P.
33 A, B 34 35 36		T.10S,R.8W	P	Cu (2n)	Dissem- inated	marine	Mineralized inclusions of Valdez Group rocks in sneared greenstone of the Valdez; py, po, cp, and sl disseminated in the inclu-		72 Ernestine Creek	T.5S,R.2E	P	Au	inated	Placer	Old placer Au prospect in snallow gravels in Valdez Group terrane	P. 43
33 A, B 34 35 36							sions	Jonnson, 1915., p. 171- 172	73 Hurtle Creek	T.5S,R.1W	P	Au	Dissem- inated	Placer	Shallow placer Au deposits in Valdez Group terrane	Ne.
33 A, B 34 35 36	Curly Kidney	T.10S,R.8W	P	Au	Vein, lens	Hydro- thermal	Oz stringers and small lenses in snear zones that cut graywacke with minor argillite of Valdez Group; some py, aspy, and	Johnson, 1919a, p. 172	74 Lowe River	T.95, R. 3W	P	Au Au 2	Dissem- inated		Old placer Au workings	Joi 19 p.
34 35 36	Midas, All- American	T.105,R.6W	¥	Cu (Ag, Au, Zn)	Dissem- inated, vein,	marine,	Au with qz  Mineralized shear that averages about 1 m wide and is about 300 m long;	Jonnson, 1915, p. 151-153,	75 McCallum	T.85,R.7W	P	Au?	Vein	Hydro- tnermal	Phyllitic argillite and graywacke of Valdez Group; cut by Au-Dearing gz veins	
34 35 36					massive	genic, hydro- tnermal	mainly in dark slate of Valdez Group near schis- tose greenstone; ore consists of py, po, cp, sl, and traces of gn	156-157, 187-188; Moffit & Fellows, 1950, p. 51-52; Rose, 1965,	76 Orion	T.105,R.7W	P	, Au?	Vein	Hydro- thermal	Thin gt vein traceable for about 75 feet in gray- wacke and argillite of Valdez Group; contains aspy, po, and py	Joi
35 36 37	Addison-Powell Sulphide Gulch	T.10s,R.5W	<u>P</u>	Cu (Ag, Au, Zn)	Massive, vein, dissem- inated	marine volcano-	Stratiform iron-stained lenses and disseminations in mafic metavolcanic and	<pre>p. 5-12 Johnson, 1916, p. 140;</pre>	77 Patten Mining Co., Golden, Happy Days	T.95,R.7W	P	Au	Vein	Hydro- thermal	Au-pearing quartz veins in argillite and gray- wacke of Valdez Group	Joi 19: P. Mul:
35 36 37					mateu	genic, hydro- thermal	metasedimentary rocks of the Valdez Group both north and south of glacier terminus; probably a large low-grade deposit; con- tains po, py, cp, and sl		78 Wortmanns Glacier	T.105,R.3W	0	Cu (2n, Pb, Ag)	Massive vein, dissem- inated	marine	Iron-stained lenses and disseminations in mafic metavolcanic and meta- sedimentary rocks of	P. Th:
36 37 38	Townsend and Holland	T.85,R.1W	P	Au	Vein	Hydro- thermal	Thin qz veins in sheared slate of Valdez Group	10, 12-14 Moffit, 1935, p.					Inaced	hydro- thermal	Valuez Group; cut by qr	
37	Knowles	T.65,R.1W	Р	Au (Pb)	Vein, lens	Hydro- thermal	Lenticular qz veins, gen- erally less than 1 m thick and as much as 300 m long, cutting Valdez Group slate	1935, p. 32-35	79 Tsina Glacier	T.75,R.3W	0	Cu (2n, Pb, Ag)	Massive vein, dissem- inated	marine	Iron-stained lenses and disseminations in mafic - metavolcanic rocks of Valdez Group; cut by ga veins; both veins and	Th:
38	Eagle (Ellis)	T.6S,R.1W	м	Au (Pb)	Vein	Hydro- thermal	and graywacke; contains a little Au, py and gn Oz veins, generally less than 1 m thick in Valdez	Moffit, 1935,	86 Granatina River	T.55,R.3E	0	Dr (Po Ao	Dissen-	thermal	country rocks contain py, cp, gn, and si Stratiform iron-stained	Tha
	Ross	T.6S,R.1W	P	Au (Pb)	Vein,	Hydro-	Group slate and graywacke near Tertiary felsic por- phyry dikes; the veins con- tain minor Au, aspy, and gr Thin qz veins and lenses						inated	tnermal? replace- ment	zones extend as much as several nundred meters in quartz-mica schist of Haley Creek terrane; zones contai py, sl and in?	
			Д.		lens	thermal	in siliceous Valdez Group rocks near felsic dikes; the qz contains minor Au, aspy, and gr.	1916, p. 177- 178	81	T.75,R.6E	0	Cu (Sn?)			Diffuse, widespread iron- stained zones in mylonitic metavolcanic rocks of Haley Creek terrane; zones contai py, cp?, sl?	
	Portland	Tps.6,7S,R.1E	P P	Au	Vein,		Thin gz veins and lenses in Valdez Group  Thin gz veins and lenses	Moffit, 1918, p. 177	82 Marshall Mountain	T.25, R.4%	P	Cu	Dissem- inated	marine volcano-	Sneared pillow basalt and massive greenstone of McHugh Complex; contain	None
	Telluride, Wetzler (Quail)	T.65,R.1W	м	Au (Cu, Pb, Zn)	Vein	thermal	in Valdez Group  Numerous thin qz veins in siste and sheared graywacke							genic	py, po, and cp	dece cab at pec time
							of Valdez Group near Ter- tiary felsic dikes; the veins contain Au, gn, sl, aspy, and cp, minor produc- tion frm Wetzler	180-181; Moffit, 1935, p. 27-29								nea: Klus Lake dica
41	Quartz Creek	T.5S,R.1W	P	Au (Cu, Pb)	Vein	Hydro- thermal	Thin gz veins in closely folded Valdez Group slate and schistose graywacke; cut by porphyritic dikes;	Moffit, 1918, p. 179-	03 Property County	m le p 0t	P	Cw (No. Be2)	Disser-	Magmatic	There nite in serpentinized	thi:
	Bernard (Red) Mountain	T.3S,R.1E	<u>P</u>	Cr (Ni, Pt)	Massive,	Magmatic	veins contain aspy, gr., and cp Layers, lenses and dissem- inations of chromite in	Berg & Cobc,	83 Barnette Creek 84 Heavenly Ridge	T.1S,R.9W	P O	Cr (N1, Pt?)  Mo, Cu (2n)	nated, podiform Dissem-	Hydro-	Test pits in serpentinized ultramafic rocks; cut by dacite dikes  Mafic volcanic breccia of	Thi
					inated		dunite; minor anomalous concentrations of Pt-group elements, Cu, and Ni in some of the ultramafic and associated rocks	1967, p. 49, 52: Jasper, 1967, p. 4;		m oc p 100			nated, vein		Talkeetna Formation cut by dacite plug; stringers and pods of sulfide-impregnated gz Reported lode claims	U.S
43 A, B	Dust Mountain	T.35,R.3E	<u>P</u>	Cr (Ni, Pt)	Massive, dissem-	Magmatic	Chromite-rich lens and disseminations in dunite;	Hoffman, 1974 Berg & Cobc,	85 Columbia Glacier (W)	T.95,R.10W	P	Au		?	(1916) in Orca Group	Bure of 1 198
44	Willow Mountain	T.15, R.1E	0	2n (Cu)		Hydro- thermal	Py, hydrozincite, cp, and ml sparsely but widely	1967, p. 52 Berg &	B6 Columbia Glacier (E)	T.95,R.10W	ř.	Au	?	Plane	(1968) in Orca Group	Bure of 1
							distributed in brecciated mafic tuff of Talkeetna Formation	1967, p. 52; Mac- Kevett & Holloway, 1977, p.	87 Fort Liscum	T.9S,Rs.6,7W	<u>P</u>	Au (Pb, Zn, Ag)	Dissem- inated		Reported placer claims (1974-73)  3 patented claims north	Bur of 1
	Opal, Tiger Mining Co.	T.4S,R.4E	m	Au (Ag, Pb, Zn)	Vein	Hydro- thermal	Widely spaced quartz veins generally less than	83; this study MacKevett and Hol-		1.03, 1.34		Na (12, 211, 13)		thermal	of Ramsay-Rutherford; not visited during this study; setting presumed to be sim- ilar to Ramsay-Rutherford	Bure of
							I m thick cutting senist of the Liberty Creek terrane and Eocene tona- lite; the veins contain aspy, py, qn, sl, and Au and Ag; recently active	1977; p. E1: this study	89 Wortmanns	T.95, R. 4W	P	Au	Dissem- inated	Placer	Reported placer claim (1900)	Bure of I
46	Fivemile Croes.	T. 15, R. 5E	o	Au, Ng (PD)	?	3	Reported Loge that con- tains A., Ag, and go:	Berg &	90 Sheep Creek	T.9S,R.3W	<u>P</u>	Au	Dissem- inated		Reported placer claims (1971-73)	U.S. Bure of !
47	Liberty Falls	T.3S,R.5E	<u>P</u>	Mn	Vein, lens	Hydro- tnermal	Lenses that contain manganite-bearing gz vein-	1967, b. 49 Berg & Copb, 1967,	91	T.8S,R.3W	<u>P</u>	Au	Vein		Reported lode claim (1953, 55) in Valdez Group	of 1
							lets; in chloritic schist of the Liberty Creek ter- rane	p. 49: Jasper, 1967, p. 4	92 Worthington Glacier 93 Glacier Creek	T.85,R.3W	P	Au	Vein	Hydro-	Reported lode claim (1968, 71, 73) in Valdez Group	of I
48	Blackney	T.5S,R.6E	Р	Cu	Vein	Hydro- thermal	Thin parallel veins that contain py and op in meta- volcanic rocks of the Sko- lai near Jurassic dioritic pluton	Moffit, 1914, p. 51-51	93 Glacier Creek	T. 65, R. 1W		Au	Veril	thermal	(1923, 26) on irregular sulfide-impregnated qz veins in graywacke and argillite of Valdez Group; numerous dacite	Bure of 1 1981
49	Surprise Creek	T.5S,R.6E	P	Cu		marine	Mineralized zone in Drec- ciated volcanic rock of Skolai Group that contains veins and disseminations of cp, py, chrys, cc, and Dn; Jurassic dioritic pluton nearby		94 Squaw Creek	T.6S,R.1E	P	Au (Pb. Zn, Ag)	Vein	Hydro- thermal	dikes in vicinity  Reported lode claim (1972- 1979) on sulfide-Impregna- ted qz vein cutting gray- wacke and argillite of Valdez Group; numerous dacite dikes in vicinity	U.S Bure of I
50	Divide Creek	T.6S,R.6E	P	Cu	Vein, dissem- inated	Hydro- thermal, sub- marine volcano-	Veins and disseminations that carry cp, bn, cv, and ml in fractured green- stone of Skolai Group	Moffit, 1914, p. 52	95	T.5S,R.2W	P	Au (As, Fe)	7	7	Reported lode claims (1953-1972) in Valdez Group	U.S Bure of ! 198:
51	Falls Creek	T.6S,R.6E	P	Cu	Dissem- inated	genic? Sub- marine	Disseminated bn, cp, and cv in metavolcanic rocks of Skolai Group	Moffit, 1914, p. 52	96 Kimball Pass (W)	T. 45, R. 2E	<u>P</u>	Au	Vein	Hydro- thermal	Reported lode claims (1969, 70) in Haley Creek terrane	of i
52	Spirit Mountain	T.6S,R.6E	<u>P</u>	Ni, Cu (Co, Pt, Ag)		genic Magmatic	Massive and disseminated sulfides and their alteration products in peridotite	Kingston & Miller, 1945,	97 Kimball Pass (E)	T. 4S, R. 2E	<u>P</u>	Au?	7	7	Reported lode claim (1956) in Haley Creek terrane	Bure of !
							intrude the Haley Creek terrane; some granitic and gabbroic intrusions in the vicinity; the sulfide mine-	1970	98	T.45,R.2E	<u>P</u>	Au?	?	?	Reported lode claims (1969) in Haley Creek terrane	U.S Bure of ! 198
							rals include bravoite, pent landite, po, cp, sl, and py some analyses show abundant As, probably indicative of arsenides, and minor anomal	;	99	T.45,R.2E	<u>P</u>	Au	Vein	Hydro- thermal	Reported lode claims (1969, 70) near fault contact between Haley Creek and Fox Creek terranes	U.S Bure of I
53	Chance	T. 25, R. 7E	P	Cu	Coating,		amounts of Co, Ag, and Pt group elements, chiefly Pd Ml coatings and a little bn in upper part of Nik-	Moffit & Mertie	100 Tonsina River	T. 2S, R. 2E	<u>P</u>	Au	Dissem- inated	Placer	Reported placer claims (1973-1978)	U.S Bure of 1
	Lawton, Leland, Albert Johnson,	T.25, R.7E	<u>P</u>	Cu	Vein,	volcano- genic?	olai Greenstone  Py, cp, bn, ml, and cl as veins and small impregna-	1923, p. 125 Moffit & Mertie	101 Willow Creek	T.15, R. 2E	<u>P</u>	Au?	?	7	Reported lode claims (1969, 70)	U.S Bure of
	Guthrie, Cliff, Fog, Elliott Creek				impreg- nation	sub- aerial	tions and coatings in Nikolai Greenstone, some near a porphyry dike	1923, p. 118- 119, 124- 125; Men- denhall, 1905, p.	102 Hundell Creek	T.35,R.4E	<u>P</u>	Au	Vein	Hydro- thermal	(1953) in Liberty Creek & terrane	MacKe Hol 1977 p. 8 U.S
	Curtis, Elizabeth, Goodyear, Henry Prather, Lizzie G., Louise, Marie	T.2S,R.7E	<u>P</u>		coating	thermal, sub- aerial	Veins and coatings in small breccia zones and shear zones in Nikolai Greenstone; the deposits	Moffit & Mertie, 1923, p. 120-124;	103 Fox Creek	T.45, R.4E	<u>P</u>	Cu (Ba, Mn)	7	7	Reported lode claims (1971-78) in the Fox Creek terrane	U.S Bure of I
56		T.3S,Rs.7,8E	<u>P</u>		Vein,	genic? Hydro-	Mainly in and near shear	Moffit, 1915, p. 112-113 Moffit &	104 Taral	T.4S,R.5E	<u>P</u>	Cu	Vein?	Hydro- thermal?	Reported lode claims (1971-1978) in Haley Creek terrane	U.S Bure of 1
	Copper King, Mineral King, Swazie					sub- aerial	zones in Nikolai Green- stone; contain py, bn, cc, cp, az, ml and cl; tne Swazie is in fractured Chitistone Limestone ad- jacent to a fault and	Mertie, 1923, p. 122- 123	105 Wood Canyon	T.5S,R.5E	<u>P</u>	Cu	Veln?	Hydro- thermal?	Reported lode claim (1956) in Haley Creek terrane	U.S Bure of 1
	Ammann, Mullen, Cave, Mountain Sheep, Peacock	T.2S,R.7E	<u>P</u>			thermal,	near Nikolai Greenstone Veins and coatings in	Moffit & Nertie, 1923, p.	106 Summit Lake A, B, C, D	Ts.6,7S, Rs.6,7E	<u>P</u>	Ní, Cu	Dissem- inated, massive?		terrane	
						genic?	Greenstone; contain py, bn, cp, cc, cv, ml, and az; Mullen has traces of	101-103: Van Ai- stine & Black 1946,	107	T.45,R.7E	P	Pb (Ag)	Vein?	Hydro-	Reported lode claims	Mine 198
50	Ammana Blue	₩ 3C De 7 DF	P	60	Vois		Ag and Au; some of the prospects have similarities with Kennecott-type copper deposits	125-130	108 Iron Creek	T. 35, R. 7E	P	Cu	Vein?	thermal?	(1969-1979) in metavol- canic rocks of the Skolai Group	Bure of 198
	Ammann, Blue Bird, Bunker Hill, Forget Me Not, Mountain (Montana) Boy	T.2S,Rs.7,8E	Ē		coating	sub- aerial volcano-	Mainly in Nikolai Green- stone but locally in Chitistone Limestone; mainly veins in shear and fracture zones; contain cp, bn, enargite, cv,	Moffit a Mertie, 1923, p. 103; Van Alstine & Black,	109 Loraine Creek	T. 35, R. 7E	Р	Au	?		(1916) in metamorphosed Skolai Group Reported lode claims	of 1 198
59	Benito Creek	T.3S,R.7E	<u>P</u>	Au (Ag, Cu)	Vein	Hydro-	cc, az, ml, py, and traces of Au Au-bearing gz vein that cuts gabbro and metavol-	1946, p. 130-132 Moffit a Mertie,		# 25 p %			Vein?	uudra	(1913, 1979) in metamor- phosed Skolai Group; set- ting probably similar to Benito Creek (#59) Reported placer claims	of 198
							py, aspy, cp, and kg	1923, p. 142-143	110 Copper Creek	T. 2S, R. 7E	P	Au (Au. Ag)			and lode claims (1955); no information on bed- rock  3 patented claims; not	Bure of 198
	Tiekel	T.6S,R.1E	<u>P</u>			tnermal		MacKevett & Hollo- way, 1977 p. 82	111 Cheshnina River	T.1N,R.6E	P	Cu (Au, Ag)	7		visited during this study; location near contact between basal Nikolai Greenstone and top of len- ticular limestone at top	
		T. 45, R. 6E	P		inated, veir.		and me in granitic rocks	MacKevett MacKevett May, 1977 May, 1977 May, 1977 May, 1977	112 Chetaslina River	Ts.1,2N,R.5E	P	Au (Ag, Ba)	Dissem- inated,	thermal	of Skolai Group; native Cu within the Nikolai nearby Bulldozer trenches across iron-stained zones in	U.S Bur
		T.85,R.7% T.85,R.6W	P	Au	Dissem- inated Dissem- inated		Small placer Au deposit	Johnson, 1915, p. 159 Grant &				e de la companya de l	replace- ment?		schistose Skolai Group (?) rocks including calc-schist and greenschist; contain py, ba, and cp?	of 198
					inated			Higgins, 1916, p. 72; Johnson, 1915, p. 186	113 Manker Creek	T. 3S, R. 2W	P	Au	Dissem- inated	Placer	(1900)	Schr 1900 p. 4 U.S. Bure
		T.9S,R.6W	P		Dissem- inated		Small placer Au deposits	Moffit, 1954, p. 308	114 Mahlo River	T.25,R.3W	<u>P</u>	Ąu	Dissem- inated	Placer	Reported placer claims (1900)	Schr 1900 422;
		T.10S,R.5W T.6S,R.1W	0	Au	inated Dissem-		Small amounts of gold panned in stream gravel Placer Au occurrence	Rose, 1965, p. 13-14							Translation (	fit, p. 3 U.S Bure lines
		T.5S,R.2E	Р	Au	inated Dissem-			Nelson, 1952, p. 3 Moffit,	115 Kaina Lake	T.1N, R.6W	<u>P</u>	Au	Vein?		Reported lode claims (1968); probably at con- tact between Talkeetna Formation and Jurassic (?) granodiorite	U.S Bur of 198
68		T.45,R.2E	P	Au	inated		Old prospect for placer Au	1918, p. 181-182 Smith, 1932,	116 Nelchina River	T. 2N, R. 7W	<u>P</u>	Au?	Dissem- inated	Placer	Reported placer claims (1971-74)	U.S Bur of 198
69	Quartz Creek	T.4S,R.1W	м		dissem-	thermal,	Oz veins and shallow placers in Valdez Group	p. 28 Moffit, 1918, p. 179	117 Glenn Highway	Ts.:2,3N,R.9W	P	Silica sand		Placer	Reported placer claims for sand (1958)	U.S Bur of 198

This report is preliminary and has not been reviewed for conformity with U.S. Geological Survey editorial standards and stratigraphic nomenclature